ATTACHMENT 1
MINUTES OF MEETINGS
JOINT FAA/INDUSTRY
NOISE ABATEMENT
WORKING GROUP
FEBRUARY 1, 1991

<u>General</u>: During the June 19, 1990 joint FAA/Industry meeting on Aircraft Noise Abatement, the FAA presented a proposed resolution to serve as a "strawman" or as a basis for initiating discussion and exploring alternative approaches. All persons attending the meeting were invited to submit comments on the FAA's proposal or to submit any counter or alternative proposal that they believed would resolve the problem. It was decided to select a smaller working group to study these comments or alternative proposals and to develop recommendations for consideration by the larger Joint FAA/Industry Group. It was also decided that the working group should consist of representatives from the pilot associations, representatives from the airlines, and an FAA representative. The manufacturers elected not to provide a representative for the working group but agreed to provide any assistance requested by the group. The following personnel were selected as members of the working group.

Gene Frank- Senior Director, Flight Standards, Northwest Airlines

Scott Griffith- Noise Representative, Allied Pilots Association

Tom McBroom- Specialist Flying Engineering, American Airlines

Joe Schwind- Deputy Director Air Safety, Air Line PIlots Assoc.

Don Jones- Flight Manager-Standards, United Airlines

Bill Phaneuf- Staff Engineer, Air Line Pilots Association

Larry Taylor- Check Airman and Noise Specialist, America West Airlines

Dick Deeds- Chairman ALPA Noise Committee, Air Line Pilots Assoc.

Wes Euler- Assistant Manager, Technical Programs Division, FAA

<u>Summary of Comments and Alternative Proposals</u>: Attachment 4 contains all of the written comments concerning the FAA's proposed resolutions as well as alternative proposals submitted by industry representatives attending the June 19, meeting. The following is a brief summary:

McDonnell Douglas: Agreed in concept for the need to establish three standard takeoff procedures with reservations about requiring automatic cutback and thrust advance systems and modified GPWS capabilities for existing fleets. Believes future systems can be fully automatic, safe and reliable and provide cutback capability for 0% engine-out gradients. Does not support action that negates presently approved procedures. Suggests that this groups efforts be integrated with the efforts presently being formulated by the Aviation Systems Capacity Task Force Noise Working Group.

Fokker Aircraft: Does not disagree with the concepts in the FAA's proposed resolution. Offered recommendations concerning speed requirements, sequence of thrust and flap selection, reduced thrust takeoffs, and the alert eye position. Disagrees with the requirement for the pilot flying being able to perform the maneuver without assistance. Believes crew coordination essential to provide for minimum pilot workloads. Recommends that a specific section be developed to address airworthiness requirements such as performance, handling qualities, failure analysis, etc. and another section dealing with operational test and evaluations to make it clear as to whether FAA Flight Standards or Airworthiness should be approached for approval.

Boeing: Offered an alternative proposal as well as comments and recommendations to the FAA's proposal. Recommendations concerned speed requirements, initiating altitudes, tying automatic thrust recovery systems to Part 25.111 gradients instead of altitude, tying automatic thrust cutback systems to altitude for crew workload purposes, GPWS requirements, provisions to arm an automatic pilot or a flight guidance system, thrust setability, aircraft controllability and flight guidance systems. The alternative proposal contained two primary elements: (1) Cutbacks below 1,000 feet AGL and/or below Part 25.111 engine inoperative gradients would not be allowed, and (2) airport noise rules based on noise monitors closer than the distance necessary for airplanes to become stabilized at cutback power after reaching 1,000 feet AGL would not be allowed. Emphasized that element (2) would have to be an essential ingredient to the viability of the alternative proposal.

Air Transport Association: Offered no specific comments on the FAA's proposed resolution. Instead offered an alternative proposal consisting of the following:

(a) CLOSE-IN (less than 3nm nominal):

1. Takeoff and climb to 1,000 feet AAE.
2. Pitch not to be exceed manufacturer's recommended maximum pitch attitude.

3. At 1,000 feet reduce thrust to not less than Part 25.111 engine inoperative climb gradients or 0% gradients for aircraft equipped with auto thrust recovery systems. Maintain takeoff configuration and V_2 + 10-20 knots.

4. Continue climb at V_2 + 10-20 knots to 3,000 feet then set climb thrust and accelerate while retracting flaps on schedule.

(b) FAR-OUT (beyond 3 miles nominal)

1. Takeoff and climb to 1,500 feet AAE.

2. Pitch not to exceed manufacturers recommended maximum pitch attitude.

3a. HIGH BYPASS ENGINES

At 1,500 feet set climb thrust, accelerate to V_{zf} while retracting flaps on schedule.

3b. LOW BYPASS ENGINES

At 1,500 feet accelerate to V_{zf} while retracting flaps on schedule and then set climb thrust.

4. Climb at V_{zf} to 3,000 feet AAE and then initiate normal climb profile.

ATA emphasizes that Stage III aircraft provide the highest level of noise technology currently available, consequently, local use restrictions should not be permitted to discriminate against any aircraft which qualifies as Stage III. Airports and/or communities must not impose noise restrictions which would necessitate thrust cutbacks below 1,000 feet.

First Working Group Meeting - The first working group meeting was held in Washington, DC on July 24 and 25, 1990. The group reviewed in detail the comments and proposals that were submitted in response to the FAA's proposal. It was then agreed to discuss in detail all facets of the noise abatement vertical profile. To ensure an orderly discussion and mutual understandings, the noise abatement profile was segmented as follows:

(a) Takeoff segment = Brake release to 1st transition.

(b) First transition segment = Thrust cutback and/or Flap retraction.

(c) Reduced Noise segment = Portion of climb out at reduced thrust and/or constrained airspeed.

(d) Second transition segment = Reestablishment of normal climb (thrust, configuration, and/or airspeed).

(e) Enroute climb segment = Normal climb procedures to altitude.

The working group considered the following factors and their related effects, as appropriate, for each of the segments of the takeoff profile. The effects and the interrelationships of these effects were discussed in detail as to their impact on the flight path, safety of operations, and the noise benefits obtained throughout the takeoff profile.

(a) Max rated takeoff thrust - Reduced thrust takeoff.
(b) Takeoff rotation rates and techniques.
(c) Initial climb pitch attitudes.
(d) Altitudes to initiate 1st transition segment.
(e) Flight path (pitch angle) changes.
  - Amounts of change
  - Techniques for performing change
  - External visual capabilities - Alert eye position
  - Flightcrew workloads
(f) Flight guidance considerations
(g) Aircraft performance
  - Normal climb gradients - All engine/engine inop
  - Part 25.111 gradients - All engine/engine inop
  - 0% gradients - all engine/engine inop
  - Minus gradients - all engine/engine inop
  - Flaps up - Flaps down
  - Turns
  - Power reserves
(h) Thrust reduction and thrust reapplication techniques
(i) Thrust setability considerations
(j) Auto thrust reduction systems
  - Arming and inhibiting mechanisms
  - Pilot single action
(k) Auto thrust restoration systems
(l) Crew alerting systems (GPWS)
(m) Induced failures resulting from power and configuration changes, and mode switching.
(n) Aircraft emergencies
(o) Aircraft controllability considerations
(p) Air traffic see and avoid considerations - TCAS
(q) Obstacle clearance requirements
(r) External phenomena
  - Wake Vortex
  - Wind Shear
  - Icing
  - Turbulence
  - IMC
(s) Navigation and ATC clearance considerations
(t) Pilot comfort levels - Pilot performance - Pilot distractions
(u) Passenger comfort.

As the group discussed the effects of the above factors for each segment of various noise abatement procedures, it became apparent that the more a procedure (or factor) diverged from a normal takeoff profile, the more critical the effects become with respect to safe flight operations. As the procedural diversions became greater, the effects tended to compound and become more complex. Although the use of automatic systems would appear to alleviate this compounding to a certain extent, the automatics themselves introduce a different set of effects and workloads associated with monitoring performance of the automatic systems. During the first meeting the group did not reach consensus as to when a particular effect, set of effects, or compounded effects adversely impacted safety of operations.

The group also discussed the factors and the related noise relief provided during each segment of various noise abatement profiles. The group had at its disposal the results of a 1984 FAA test conducted with Stage II aircraft. The group did not have data for Stage III aircraft to make comparisons or to understand the amount of noise relief provided by Stage III aircraft during a particular segment of a noise abatement profile. In general, however, the group believed that the noise profiles and footprints of Stage II and Stage III aircraft would be similar in shape, but that for any particular segment of the takeoff profile, the amount of noise relief might be significantly different for the Stage III aircraft. Questions continually raised were; does a deep thrust cutback in Stage III aircraft result in noise relief benefits throughout all segments of both close-in and distant noise abatement procedures, is the noise relief pattern produced by Stage III similar to Stage II aircraft, and are the results consistent for various takeoff weights? The group believed it needed more information concerning these questions before developing recommendations for standard close-in and distant noise abatement procedures suitable to both Stage II and Stage III aircraft. The answers to these questions are also important when it is understood that the objective is to develop standard noise abatement procedures to be used routinely at numerous airports and runways nationwide.

Don Jones of United Air Lines volunteered to conduct a series of Stage III test in a UAL B-737-300 simulator which is outfitted with a computerized noise evaluation program. This program records aircraft performance parameters and noise levels (SELDB) versus distance from brake release. The group agreed upon the series of takeoff profiles to be flown in these tests (see Attachment 5). ALPA and APA pilots volunteered to participate in the tests. The group agreed to reconvene after the tests were completed.

Second Working Group Meeting: The second working group meeting was held in Washington, DC on November 14 through 16, 1990. The first part of the meeting was spent reviewing the results of the tests conducted in UAL's B-737-300 (see noise profiles in Attachment 5). Although the UAL data was not displayed in the same manner as the 1984 FAA data, it was evident that the Stage III aircraft were substantially less noisy than Stage II aircraft. It was also evident that a deep thrust reduction in a Stage II results in a greater proportionate noise reduction as a comparable thrust reduction in a Stage III aircraft. The results of the tests, however, indicated that although the amounts and proportions of noise reduction obtained through deep thrust cutbacks were noticeably different, the basic patterns of noise reduction between Stage II and Stage III aircraft were similar.

The group then reviewed past discussions on the factors associated with noise abatement procedures and their effects on the safety of flight operations. The group concluded that only two basic (standard) takeoff noise abatement procedures (one close-in and one distant) applicable to all types of turbojet aircraft over 75,000 pounds should be adopted. The group believes this approach is appropriate because of the dramatic changes within the air transportation industry that are associated with rapid growth, new technology, and airport/airspace capacity problems. Other reasons include the following:

1. The rapid influx of new aircraft as well as new and different flight guidance and control systems can and has led to significantly different procedures and flightcrew workload requirements for each aircraft type. For air carriers with mixed fleets, different noise abatement procedures for each aircraft type complicates the standardization of flightcrew training, makes it difficult to overcome ingrained human habit patterns and adversely affects retention of flightcrew proficiency.

2. Many air carriers experience rapid turnover of flightcrew members from one aircraft type to another and from one flightcrew position to another. This often results in flightcrews having a low flight time experience in a particular aircraft type or crewmember position. To permit different noise abatement procedures between aircraft types exacerbates the problems associated with low flight time experience and crew pairing for a particular aircraft type.

During the balance of this meeting, the group began to formulate their recommendations and the reasons for those recommendations

Third Working Roup Meeting: The third working group meeting was held in Washington DC on December 19, 1990. During this meeting, the working group finalized their recommendations and discussed options for the drafting and presentation of the recommendations to the larger joint FAA/Industry Noise Abatement Group. The recommendations are in Attachment 2.